CLAIMS

1. ~~Composition~~ A composition intended to be formed into a material or an item which comprises:

- a semi-crystalline thermoplastic resin X_1 or several compatible thermoplastic resins X_1 to X_n, at least one X_1 of which is semi-crystalline, and
- at least one block (sequential) copolymer,
- n being an integer equal to or greater than 1,

characterized in that:

- the block copolymer comprises at least three blocks A, B and C connected to one another in this order, each block being either a homopolymer or a copolymer obtained from two or more monomers, the A block being connected to the B block and the B block to the C block by means of a covalent bond or of an intermediate molecule connected to one of these blocks via a covalent bond and to another block via another covalent bond, and in that:
- the A block is compatible with the thermoplastic resin or resins X_1 to X_n,
- the B block is incompatible with the thermoplastic resin or resins X_1 to X_n and incompatible with the A block,
- the C block is incompatible with the thermoplastic resin or resins X_1 to X_n, the A block and the B block.

2. ~~Composition according to Claim 1, characterized in that~~ the B block has a glass transition temperature $Tg_{(B)}$ of less than 23°C.

3. Composition according to Claim 1 or 2, characterized in that the $Tg_{(B)}$ of the B block is less than 0°C.

4. ~~Composition according to Claim 1 or 2, characterized in that~~ the $Tg_{(B)}$ of the B block is less than -50°C.

5. ~~Composition according to one of Claims 1 to 4, characterized in that~~ the C block has a glass

transition temperature $Tg_{(C)}$ or a melting temperature $M.t._{(C)}$ which is greater than the $Tg_{(B)}$ of the B block.

6. ~~Composition according to one of Claims 1 to 5, characterized in that~~ the copolymer with at least three A, B and C blocks comprises, as side products of its synthesis, a B-C diblock copolymer and optionally C homopolymer.

7. ~~Composition according to one of Claims 1 to 5, characterized in that~~ the copolymer with at least three A, B and C blocks comprises, as side products of its synthesis, an A-B diblock copolymer and optionally A homopolymer.

8. ~~Composition according to one of Claims 1 to 7, characterized in that~~ the B block is chosen from poly(dienes), in particular poly(butadiene), poly(isoprene) and their statistical copolymers, or alternatively from poly(dienes), in particular poly(butadiene), poly(isoprene) and their statistical copolymers, which are partially or completely hydrogenated.

9. ~~Composition according to one of Claims 1 to 8, characterized in that~~ the A block is connected to the B block via an oligomer resulting from a linkage of monomer units of at least two different monomers in an alternating or random order.

10. ~~Composition according to one of Claims 1 to 9, characterized in that~~ the B block is connected to the C block via an oligomer resulting from a linkage of monomer units of at least two different monomers in an alternating or random order.

11. ~~Composition according to one of Claims 1 to 10, characterized in that~~ it comprises:

- from 25 to 95%, advantageously from at least 50% and preferably from 65 to 95% by weight of the thermoplastic resin or resins X_1 to X_n,
- the remainder (to 100%) by weight of the copolymer comprising the three A, B and C blocks connected to one another, these percentages being

calculated with respect to the total weight of thermoplastic resin(s) with the block copolymer, and in that the block copolymer comprises:

- 20 to 93 parts by weight of A sequences
- 5 to 68 parts by weight of B sequences
- 2 to 65 parts by weight of C sequences.

12. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(carbonate), and
- the remainder to 100% of the PMMA-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

13. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(carbonate) PC, and
- the remainder to 100% of the poly(cyclohexyl methacrylate)-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

14. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(butylene terephthalate) PBT, and
- the remainder to 100% of the PMMA-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

15. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(oxyethylene) POE, and

- the remainder to 100% of the PMMA-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

16. A composition ~~according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(propylene) PP, and

- the remainder to 100% of the poly(nonyl methacrylate)-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

17. A composition ~~according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight:

- at least 50% and preferably from 65 to 95% of poly(amide) PA,

- the remainder to 100% of the poly(caprolactone)-PB-PS triblock copolymer,

these percentages being calculated with respect to the total weight of thermoplastic resin(s) and of the block copolymer.

18. A composition ~~according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight, at least 50% and preferably from 65 to 95% of semi-crystalline thermoplastic fluorinated resin(s) and the remainder (to 100%) by weight of at least one block copolymer with a number-average molecular mass (M_n) of greater than or equal to 20,000 $g.mol^{-1}$, preferably of between 50,000 and 200,000 $g.mol^{-1}$, composed of:

- 20 to 93 and advantageously of 30 to 60 parts by weight of A sequences,

- 5 to 50 and advantageously of 10 to 40 parts by weight of B sequences,

- 2 to 50 and advantageously of 5 to 40 parts by weight of C sequences,

the percentages being calculated with respect to the total weight of fluorinated resin(s) with the block copolymer.

19. ~~Composition according to Claim 18, characterized in that~~ it comprises poly(vinylidene difluoride) (PVDF) as thermoplastic fluorinated resin and a poly(methyl methacrylate)-poly(butadiene)-poly(styrene) triblock copolymer.

20. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight, at least 50% and preferably from 65 to 95% of semi-crystalline thermoplastic vinyl resin(s) and the remainder (to 100%) by weight of at least one block copolymer with an M_n of greater than or equal to 20,000 $g.mol^{-1}$, preferably of between 50,000 and 200,000 $g.mol^{-1}$, composed of:

- 20 to 93 and advantageously of 30 to 60 parts by weight of A sequences,
- 5 to 68 and advantageously of 11 to 55 parts by weight of B sequences,
- 2 to 50 and advantageously of 5 to 49 parts by weight of C sequences,

the percentages being calculated with respect to the total weight of vinyl resin(s) with the block copolymer.

21. ~~Composition according to Claim 20, characterized in that~~ it comprises poly(vinyl chloride) (PVC) as semi-crystalline thermoplastic vinyl resin and a poly(methyl methacrylate)-poly(butadiene)-poly-(styrene) triblock copolymer.

22. ~~Composition according to Claim 20, characterized in that~~ it comprises chlorinated poly(vinyl chloride) (CPVC) as semi-crystalline thermoplastic vinyl resin and a poly(methyl methacrylate)-poly(butadiene)-poly(styrene) triblock copolymer.

23. ~~Composition according to one of Claims 1 to 11, characterized in that~~ it comprises, by weight, at least

50% and preferably from 65 to 95% of semi-crystalline styrene thermoplastic resin(s) and the remainder (to 100%) by weight of at least one block copolymer with an M_n of greater than or equal to 20,000 $g.mol^{-1}$, preferably of between 50,000 and 200,000 $g.mol^{-1}$, composed of:

- 20 to 93 and advantageously of 30 to 60 parts by weight of A sequences,
- 5 to 50 and advantageously of 10 to 40 parts by weight of B sequences,
- 2 to 50 and advantageously of 5 to 40 parts by weight of C sequences,

the percentages being calculated with respect to the total weight of styrene resin(s) with the block copolymer.

24. ~~Composition according to Claim 23, characterized in that~~ it comprises poly(styrene) as semi-crystalline thermoplastic styrene resin and a poly(styrene)-poly(butadiene)-poly(methyl methacrylate) triblock copolymer.

25. ~~Composition according to one of Claims 1 to 24, characterized in that~~ it additionally comprises one or more thermoplastic polymer(s) D compatible with the C sequences, D being present in an amount of less than 10% of the total mass of thermoplastic resin(s) X_1 to X_n and of the block copolymer(s) with, possibly, its side products.

26. ~~Process~~ for the preparation of a material or of an item from the composition according to ~~one of Claims 1 to 25~~, characterized in that it comprises the following stages:

- the thermoplastic resin(s) X_1 to X_n is (are) mixed in the molten state with the block copolymer(s) and optionally the thermoplastic polymer(s) D, optionally in the presence of additives and/or of fillers which can remain in a solid state,

- the liquid or the molten material (optionally with the suspended fillers) thus obtained is cooled to give a material or an item in the solid state.

27. ~~Material~~ or item having a composition according to ~~one of Claims 1 to 25~~, characterized by the following specific heterogeneous structure:

- the structure is formed of a continuous phase (matrix) formed essentially of the thermoplastic resin or resins X_1 to X_n comprising a non-continuous phase dispersed in a very even manner as nodules with a size D_n of less than 0.5 micrometre,

- each nodule comprises an internal region composed mainly or essentially of C blocks and an external peripheral region comprising the B blocks of the copolymers with at least three A, B and C blocks connected to one another in this order, this peripheral region surrounding the internal region in a continuous or discontinuous fashion.

28. Material or item according to Claim 27, ~~characterized in that~~ the copolymer with at least three A, B and C blocks comprises, as side products of its synthesis, a B-C diblock copolymer and optionally C homopolymer and that the heterogeneous structure specific to this composition is modified in that the internal region of the nodules, composed mainly or essentially of C blocks, surrounds one or more domains composed essentially of B blocks of the B-C diblock.

29. Material or item according to Claim 27 ~~or 28, characterized in that~~ the nodules have a size D_n ranging from 30 to 350 nanometres.

30. Material or item according to Claim 27 ~~or 28, characterized in that~~ the nodules have a size D_n ranging from 60 to 250 nanometres.

31. Material or item according to ~~one of Claims 27 to 30, characterized in that~~ the distance between two neighbouring nodules D_i is between 1.1 and 5 times the value of the size D_n.